

CLAIMS

1. A wire bond-less electronic component for use with a circuit external to the wire bond-less electronic component, the wire bond-less electronic component
5 comprising:

a support substrate;

an electronic device over the support substrate; and

a cover located over the electronic device and the support substrate and
comprising:

10 an interconnect structure electrically coupled to the electronic device and adapted to electrically couple together the electronic device and the circuit for providing impedance transformation of an electrical signal between the electronic device and the circuit.

15 2. The wire bond-less electronic component of claim 1 wherein:
the interconnect structure is located within the cover.

3. The wire bond-less electronic component of claim 1 wherein:
the interconnect structure is located at a surface of the cover.

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4. The wire bond-less electronic component of claim 1 further comprising:
electrical leads located adjacent to the cover,
wherein:

the interconnect structure electrically couples together the electronic
5 device and the electrical leads; and
the electrical leads electrically couple together the interconnect structure
and the circuit.

5. The wire bond-less electronic component of claim 1 wherein:
10 the wire bond-less electronic component is a surface mount device.

6. The wire bond-less electronic component of claim 1 wherein:
the cover is self-aligned to the support substrate.

15 7. The wire bond-less electronic component of claim 1 wherein:
the electronic device is located in a device substrate; and
the cover is self-aligned to the device substrate.

8. The wire bond-less electronic component of claim 1 wherein:
20 the impedance transformation provided by the interconnect structure comprises:
a zero inductance ground potential for the electronic device.

9. The wire bond-less electronic component of claim 8 further comprising:
an electrical terminal at least partially located over the cover,
wherein:

the electrical terminal is electrically coupled to a portion of the
5 interconnect structure providing the zero inductance ground potential.

10. The wire bond-less electronic component of claim 1 wherein:
the interconnect structure comprises:

a matching network.

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11. The wire bond-less electronic component of claim 1 wherein:
the interconnect structure comprises:

a first portion comprising a direct current bias circuit; and

a second portion comprising an impedance transformation circuit.

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12. The wire bond-less electronic component of claim 1 wherein:
the interconnect structure comprises:

a combining manifold.

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the interconnect structure provides harmonic termination of the electrical signal between the electronic device and the circuit.

Table 1. *Continued*

Study	Year	Country	Sample size	Prevalence (%)	95% CI
Wong et al. (1997)	1997	China	1000	1.0	0.5-1.7
Wong et al. (1998)	1998	China	1000	1.0	0.5-1.7
Wong et al. (1999)	1999	China	1000	1.0	0.5-1.7
Wong et al. (2000)	2000	China	1000	1.0	0.5-1.7
Wong et al. (2001)	2001	China	1000	1.0	0.5-1.7
Wong et al. (2002)	2002	China	1000	1.0	0.5-1.7
Wong et al. (2003)	2003	China	1000	1.0	0.5-1.7
Wong et al. (2004)	2004	China	1000	1.0	0.5-1.7
Wong et al. (2005)	2005	China	1000	1.0	0.5-1.7
Wong et al. (2006)	2006	China	1000	1.0	0.5-1.7
Wong et al. (2007)	2007	China	1000	1.0	0.5-1.7
Wong et al. (2008)	2008	China	1000	1.0	0.5-1.7
Wong et al. (2009)	2009	China	1000	1.0	0.5-1.7
Wong et al. (2010)	2010	China	1000	1.0	0.5-1.7
Wong et al. (2011)	2011	China	1000	1.0	0.5-1.7
Wong et al. (2012)	2012	China	1000	1.0	0.5-1.7
Wong et al. (2013)	2013	China	1000	1.0	0.5-1.7
Wong et al. (2014)	2014	China	1000	1.0	0.5-1.7
Wong et al. (2015)	2015	China	1000	1.0	0.5-1.7
Wong et al. (2016)	2016	China	1000	1.0	0.5-1.7
Wong et al. (2017)	2017	China	1000	1.0	0.5-1.7
Wong et al. (2018)	2018	China	1000	1.0	0.5-1.7
Wong et al. (2019)	2019	China	1000	1.0	0.5-1.7
Wong et al. (2020)	2020	China	1000	1.0	0.5-1.7
Wong et al. (2021)	2021	China	1000	1.0	0.5-1.7
Wong et al. (2022)	2022	China	1000	1.0	0.5-1.7
Wong et al. (2023)	2023	China	1000	1.0	0.5-1.7
Wong et al. (2024)	2024	China	1000	1.0	0.5-1.7
Wong et al. (2025)	2025	China	1000	1.0	0.5-1.7

15. A wire bond-less electronic component for use with a circuit external to the wire bond-less electronic component, the wire bond-less electronic component comprising:

a flange;

5 a semiconductor substrate supported by the flange;

a semiconductor device supported by the semiconductor substrate; and

a lid located over the semiconductor device, the semiconductor substrate, and the flange, the lid comprising:

10 a multi-functional interconnect system electrically coupled to the semiconductor device and electrically coupling together the semiconductor device and the circuit for providing a direct current to the semiconductor device and for providing impedance transformation of electrical signals from the semiconductor device to the circuit and from the circuit to the semiconductor device.

15 16. The wire bond-less electronic component of claim 15 wherein:

the multi-functional interconnect system is embedded in the lid.

17. The wire bond-less electronic component of claim 15 wherein:

the multi-functional interconnect system is located at a surface of the lid.

18. The wire bond-less electronic component of claim 15 wherein:
the lid is self-aligned to the flange.

19. The wire bond-less electronic component of claim 15 wherein:
5 the lid is self-aligned to the semiconductor substrate.

20. The wire bond-less electronic component of claim 15 wherein:
the multi-functional interconnect system comprises:
a direct current bias circuit for providing the direct current to the
10 semiconductor device, and
an impedance transformation circuit for providing the impedance
transformation of the electrical signals from the semiconductor device to the circuit and
from the circuit to the semiconductor device; and
a power combining manifold.

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21. The wire bond-less electronic component of claim 20 wherein:
the direct current bias circuit is entirely separate from the impedance
transformation circuit.

the impedance transformation circuit further provides harmonic termination of the electrical signals from the semiconductor device to the circuit and from the circuit to the semiconductor device.

23. A method of manufacturing a wire bond-less electronic component for use with a circuit external to the wire bond-less electronic component, the method comprising:

mounting a semiconductor substrate over a support substrate, the semiconductor
5 substrate supporting an electronic device; and

affixing a cover over the electronic device and the support substrate, the cover comprising:

an interconnect structure electrically coupling together the electronic device and the circuit for providing impedance transformation of an electrical signal
10 between the electronic device and the circuit.

24. The method of claim 23 further comprising:

manufacturing the electronic device in the semiconductor substrate.

15 25. The method of claim 23 wherein:

affixing the cover further comprises:

simultaneously affixing the cover to the support substrate and electrically coupling together the electronic device and the interconnect structure.

20 26. The method of claim 23 wherein:

affixing the cover further comprises:

keeping the wire bond-less electronic component devoid of wire bonds;
and
electrically coupling together the electronic device and the interconnect
structure.

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27. The method of claim 23 wherein:

affixing the cover further comprises:

self-aligning the cover to the support substrate.

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28. The method of claim 23 wherein:

affixing the cover further comprises:

self-aligning the cover to the semiconductor substrate.